

CLAIMS

1. A hydraulic valve for controlling an emergency brake on a vehicle, the hydraulic valve comprising:

a body having a main bore into which a first passage, a second passage, and a third passage open;

a first poppet slidably received in the main bore and defining a first chamber and a second chamber on opposite sides of the first poppet, wherein the first passage communicates with the first chamber;

a passageway providing a fluid path between the first and second chambers and having a dampening orifice;

a first valve seat having a seat aperture there through that extends between the first chamber and a third chamber in the bore, wherein the second passage communicates with the third chamber;

a first spring biasing the first poppet against the first valve seat;

a second poppet slidably received in the main bore on an opposite side of the first valve seat from the first poppet, and having a portion projecting into the seat aperture and engaging the first poppet;

a sensing piston slidably received in the main bore, and including a piston aperture with a first end communicating with the third chamber and with a second end communicating with the third passage, and a second valve seat formed at the first end of the piston aperture and being selectively engaged by the second poppet; and

an actuator operably coupled to transfer force to the sensing piston and thereby operate the hydraulic valve.

2. The hydraulic valve as recited in claim 1 wherein the first passage receives pressurized fluid from a source, the second passage communicates with a brake cylinder on the vehicle, and the third passage communicates with a hydraulic system reservoir.

3. The hydraulic valve as recited in claim 1 wherein the dampening orifice restricts flow of fluid between the first and second chambers thereby limiting a rate of movement of the first poppet to less than a predefined level.

4. The hydraulic valve as recited in claim 1 wherein the dampening orifice is formed in the first poppet.

5. The hydraulic valve as recited in claim 1 further comprising a second spring tending to bias the sensing piston away from the second poppet.

6. The hydraulic valve as recited in claim 1 further comprising another spring biasing the sensing piston away from the actuator.

7. The hydraulic valve as recited in claim 1 wherein the portion of the second poppet has an element that restricts fluid flow through the seat aperture to a greater degree when the first poppet is in a first position than when the first poppet is in a second position.

8. The hydraulic valve as recited in claim 1 wherein the portion of the second poppet comprises a shaft with a head at one end, wherein the head has a larger cross-sectional area than the shaft and abuts the first poppet.

9. A hydraulic valve for controlling an emergency brake on a vehicle, the hydraulic valve comprising:

a body having a main bore in which a first chamber, a second chamber, a third chamber and a fourth chamber are defined, the body further having a supply passage for conveying pressurized fluid from a source and opens into the first chamber, a cylinder passage for communicating with a brake cylinder on the vehicle and opening into the third chamber, and a return passage for communicating with a hydraulic system tank and opening into the fourth chamber;

a supply poppet slidably received in the main bore between the first chamber and the second chamber, and having a dampening orifice that provides a restricted fluid flow path between the first and second chambers thereby limiting a rate of movement of the supply poppet;

a first valve seat with a seat aperture there through and separating the first chamber and the third chamber;

a first spring biasing the supply poppet into engagement with the first valve seat;

a return poppet slidably received in the third chamber and having a pin projecting into the seat aperture and against the supply poppet;

a sensing piston slidably received in the main bore, and having a piston aperture with a first end opening into the third chamber and with a second end opening into the

fourth chamber, and a second valve seat formed at the first end of the piston aperture and selectively engaged by the return poppet;

a second spring biasing the sensing piston away from the return poppet; and

an actuator operably coupled to transfer force to the sensing piston and thereby operate the hydraulic valve.

10. The hydraulic valve as recited in claim 9 further comprising a third spring biasing the sensing piston and the actuator apart.

11. The hydraulic valve as recited in claim 9 wherein the pin has an element that restricts fluid flow through the seat aperture to a greater degree when the return poppet is in a first position than when the return poppet is in a second position in the main bore.

12. The hydraulic valve as recited in claim 9 wherein the pin of the return poppet has a shaft with a head at one end, wherein the head is larger in cross-sectional area than the shaft and abuts the supply poppet.

13. A hydraulic valve for controlling an emergency brake on a vehicle, the hydraulic valve comprising:

a body having a main bore into which a first passage, a second passage and a third passage open, the first passage for conveying pressurized fluid from a source, the second passage for communicating with a brake cylinder on the vehicle, and the third passage for communicating with a hydraulic system tank;

a supply poppet slidably received in the main bore and defining a first chamber and a second chamber on opposite sides of the supply poppet, wherein the first passage opens into the first chamber;

a first valve seat with a seat aperture there through that extends between the first chamber and a third chamber defined in the bore, wherein the second passage opens into the third chamber;

a first spring biasing the supply poppet into engagement with the first valve seat;

a return poppet slidably received in the main bore on an opposite side of the first valve seat from the supply poppet, and the return poppet having poppet body from which a shaft projects into the seat aperture wherein the shaft has a head that engages the supply poppet;

a sensing piston slidably received in the main bore, and having a piston aperture with a first end communicating with the third chamber and with a second end communicating with the third passage, and a second valve seat formed at the first end of the piston aperture and being selectively engaged by the return poppet; and

an actuator operably coupled to transfer force to the sensing piston and thereby operate the hydraulic valve.

14. The hydraulic valve as recited in claim 13 wherein the head on the return poppet has a larger cross-sectional area than the shaft.

15. The hydraulic valve as recited in claim 14 wherein the return poppet has a first position in which the head is in the seat aperture and a second position in which the head is outside the seat aperture.

16. The hydraulic valve as recited in claim 13 further comprising a passageway with a dampening orifice which provides a fluid path between the first and second chambers, the dampening orifice restricting flow of fluid between the first and second chambers thereby limiting a rate of movement of the supply.

17. The hydraulic valve as recited in claim 13 wherein the dampening orifice is formed in the supply poppet.

18. The hydraulic valve as recited in claim 13 further comprising a second spring biasing the sensing piston away from the return poppet.

19. The hydraulic valve as recited in claim 13 further comprising another spring biasing the sensing piston and the actuator apart.